

### REMARKS

Claims 1-32 and 35 are in the application.

The specification has been amended to correct two minor typographical errors. In the paragraph reporting Example 7, the labels "a" and "b" were inadvertently switched in the last line.

The claims have been amended to more particularly point out and distinctly claim applicants' invention. Independent claim 1 has been amended to include a size limitation on the base particles and to emphasize that they are inert, to help distinguish them from the titanium dioxide powder disclosed in the cited reference. Claim 6 has been amended to add most of the limitations of claim 1 and thus convert claim 6 from a dependent claim to an independent claim. Independent claims 17, 23 and 28 have been amended to add the size limitation of amended independent claim 1. Claims 33 and 34 have been withdrawn as drawn to a non-elected invention without prejudice to their representation in a subsequent continuing application. No new matter is presented thereby, and the amendments are fully supported by the application as filed, and in particular, in the specification at page 9, lines 24-25.

The Examiner has required, pursuant to 35 U.S.C. 121, applicants to elect between one of the following groups of inventions:

Group I. Claims 33-35, drawn to a process, classified in class 106, subclass 493.

Group II. Claims 1-32, drawn to an article, classified in class 428, subclass 403.

The Examiner states that inventions of Group I and Group II are related as process of making and product made. The Examiner states that inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used

to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (citing MPEP § 806.05(f)). The Examiner further states that in the instant case the process as claimed can be used to make other and materially different product. The Examiner concludes that because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Applicants respectfully confirm the provisional election the invention of Group II, claims 1-32, for prosecution in the present application, with traverse.

Applicants respectfully maintain their traverse of the restriction requirement with respect to claim 35, and respectfully request reconsideration and withdrawal of the restriction requirement. Claims 33 and 34 have been cancelled as drawn to a non-elected invention, without prejudice to their representation in a subsequent continuing application.

Claim 1 relates to a product and claim 35 relates to a process for using the product of claim 1, not to a process for producing the product of claim 1. Thus, the process of claim 35 cannot be employed with a product other than the product of claim 1.

Claims 1, 4-8, 11-12, 17, 20-23, 26-28 and 31 stand rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,521,038 ("Yanagimoto '038"). This rejection is respectfully traversed, and reconsideration and withdrawal of the rejection are respectfully requested as applicable to the amended claims.

The Examiner states that The Yanagimoto '038 discloses colored infrared-reflecting roofing granules comprising base particles coated with a cured coating composition comprising a binder and infrared reflecting pigment. The Examiner cites to

the abstract, column 1, lines 20-40, column 2 lines 1-22, lines 35-42, lines 54-67, column 4, lines 60-67, column 5, lines 1-31, lines 50-67, Example 2, and the claims.

However, Yanagimoto '038 does not disclose each and every limitation of the presently claimed invention, and thus does not anticipate the presently claimed invention.

Yanagimoto '038 relates to near-infrared reflecting composite pigments. These composite pigments are formed by mixing a near-infrared reflecting colorant dispersion with a white pigment powder or white pigment dispersion, and then drying the dispersion. The near-infrared colorant is preferably dispersed as an aqueous dispersion using hydrophilic high molecular weight dispersant. The dispersant is preferably subsequently rendered insoluble so that the white pigment powder is coated with the near-infrared colorant. The resulting composite pigment can be used in formulating inks and coatings. The composite pigment "obviates a white undercoat or the like" which had previously been required to achieve near-infrared reflectivity.

In contrast, as claimed in amended independent claim 1, the present invention is directed to colored infrared-reflective roofing granules comprising inert base particles with size passing #8 mesh and retaining on #70 mesh coated with a cured coating composition comprising a coating binder and at least one colored, infrared-reflective pigment. The inert base granules are much larger than the white pigment powder employed by Yanagimoto '038.

Yanagimoto '038 does not disclose the particle sizes of the white pigments used. However, Yanagimoto '038 employs "white pigments [that] are all available on the market . . . ." (col. 4. lines 51-52) – commercially available white pigments. However, it is well known in the art that materials useful as pigments should have the largest practical surface area and, equivalently, the smallest practical particle size, in order to be

useful. For example, in the case of organic pigments, "(f)or practical use, organic pigments having approximate particle sizes of from 0.01 to 0.1  $\mu\text{m}$  for transparent forms and from 0.1 to 10  $\mu\text{m}$  for opacifying forms have proved most suitable." United States Patent 6,423,132, col. 1, lines 11-15. Similarly, "[i]norganic pigments are normally produced for and used in the paints, plastics, or elastomer industries, and are in the form of a finely divided powder." United States Patent 6,908,675, col. 1, lines 49-51. There is a substantial art concerning granulating pigment powders to make them easier to use. For example, U.S. Patent 6,908,675 relates to agglomerating "materials less than about one micron in average diameter, and . . . preferably . . . pigments and fillers, having average particle sizes of about 0.01 to about 10 microns" (col. 4, lines 17-20). Thus, commercially available white pigment "powder" means particles with average particle sizes less than about 10 microns.

In contrast, as amended claim 1 requires "base particles" which will be retained on a # 70 mesh screen, so that the average particle size must be greater than about 200 micrometers<sup>1</sup>, an average size at least twenty times greater than Yanagimoto '038's white "pigment" and an average particle volume at least about eight thousand times greater.

Claim 1 also requires "a coating binder." This limitation is not satisfied by Yanagimoto '038's disclosure of a "dispersant." At most, when a high molecular weight ionic dispersant is used, and rendered water-insoluble by addition of multivalent ions, the "binding force between the white pigment and the near-infrared non-absorbing colorant can be enhanced." (col. 7, lines 10-13). There is no disclosure in Yanagimoto '038 that the pigment dispersant functions as a coating binder.

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<sup>1</sup> Applicants enclose for the Examiner's reference a powder size conversion table made available by Chemalloy, at <http://www.chemalloy.com/psizes1.htm>.

Because Yanagimoto '038 fails to disclose at least two limitations of the present invention as claimed by amended claim 1, claim 1 is not anticipated thereby.

With respect to claim 4, this claim depends from independent claim 1 and therefor includes all the limitations of claim 1, and for this reason alone cannot be anticipated by Yanagimoto '038. In addition, however, claim 4 requires that the coating composition further comprise at least one infrared-reflective functional pigment selected from a specific Markush group. However, Yanagimoto '038 does not disclose the use of a second infrared-reflective functional pigment. At most, Yanagimoto '038 discloses a composite pigment including a near infrared non-absorbing colorant and a white inorganic pigment. However, if the white pigment is identified with the second infrared-reflective functional pigment required by claim 4, then Yanagimoto '038 fails to disclose the base particles required by claim 1 from which claim 4 depends. Because Yanagimoto '038 does not disclose all the limitations of claim 4, claim 4 is not anticipated thereby.

Claim 5 depends from independent claim 1. Yanagimoto '038 does not disclose all the limitations of claim 1. Therefore, claim 5 is not anticipated thereby.

Claim 6 has been amended to expressly include the limitations of claim 1, and is therefore not anticipated by Yanagimoto '038 for the reasons provided above. In addition, claim 6 includes further limitations not disclosed by Yanagimoto '038. In claim 6 the base particles are not simply inert mineral particles, but rather mineral particles that are coated with a cured base coating composition including a base particle binder and at least one reflective white pigment. Yanagimoto '038, in contrast, touts the composite pigment disclosed therein as useful for avoiding having to apply an underlying reflective layer on a substrate, and distinguishes the invention disclosed therein from prior art in which a near-infrared reflective pigment-containing coating material was

applied over a coating including a reflective white pigment (col. 2, line 64 – col. 3, line 4). Because Yanagimoto '038 does not disclose all the limitations of amended claim 6, amended claim 6 is not anticipated thereby.

Claim 7 depends from independent claim 6. Yanagimoto '038 does not disclose all the limitations of claim 6. Therefore, claim 7 is not anticipated thereby.

Claim 8 is another independent claim that requires two coatings on inert mineral particles. The first coating includes a base particle binder and at least one reflective white pigment. The second coating includes a coating binder and at least one colorant. As explained above, Yanagimoto '038 avoids the use of an underlying white reflective coating layer, and therefore cannot anticipate claim 8.

Claims 11 and 12 depend from claim 8 and add further limitations. Because Yanagimoto '038 does not meet the limitations of claim 8, it cannot anticipate those claims that depend from claim 8 and add further limitations.

Claim 17 is an amended independent claim to a bituminous roofing material including roofing granules of a specific size coated with a cured coating composition including both a binder and at least one colored, infrared-reflective pigment. Yanagimoto '038 does not disclose bituminous roofing material of any type, let alone one including roofing granules of a specific size coated with a specific coating composition. Because Yanagimoto '038 fails to disclose all the requirements of amended claim 17, amended claim 17 is not anticipated thereby.

Claims 20-22 depend directly or indirectly from claim 17 and add further limitations. However, because Yanagimoto '038 does not meet the limitations of claim 17, it cannot anticipate those claims that depend from claim 17 and add further limitations.

Amended independent claim 23 is directed to a bituminous roofing product comprising a substrate sheet of a fibrous material saturated with a bituminous coating material and colored infrared reflective roofing granules formed from base particles of a specific size. Yanagimoto '038 fails to disclose bituminous roofing products of any type. Since Yanagimoto '038 does not disclose all the requirements of amended claim 23, amended claim 23 is not anticipated thereby.

Claims 26 and 27 depend from independent claim 23 and add further limitations. Because Yanagimoto '038 does not meet the limitations of claim 23, it cannot anticipate those claims that depend from claim 23 and add further limitations, and in particular, claims 26 and 27.

Amended independent claim 28 is also directed to a bituminous roofing product comprising a substrate sheet of a fibrous material saturated with a bituminous coating material and colored infrared reflective roofing granules formed from base particles of a specific size. However, Yanagimoto '038 fails to disclose bituminous roofing products of any type. Yanagimoto '038 does not disclose all the requirements of amended claim 28. Therefore, amended claim 28 is not anticipated thereby.

Claim 31 depends from independent claim 28 and add further limitations. Because Yanagimoto '038 does not meet the limitations of claim 28, it cannot anticipate those claims that depend from claim 28 and add further limitations, including claim 31.

Nor does Yanagimoto '038 render obvious any of claims 1, 4-8, 11-12, 17, 20-23, 26-28 or 31 to one of ordinary skill in the art.

Yanagimoto '038 is concerned with the problem of heat buildup when the outer walls or roof of a building or other structure are coated with a dark-colored paint, apparently a common practice in Japan, in order to make stains on the roof or walls hardly noticeable (col. 1, lines 20-31). Yanagimoto '038 teaches one of ordinary skill in

the art faced with the problem of lowering the heat absorption of dark-colored roofs a very straightforward solution – paint the roof with a coating including Yanagimoto 038's composite pigment. This teaches away from the solution disclosed by applicants, namely coating roofing granules with a coating composition including at least one colored, infrared reflective pigment, and then preparing bituminous roofing products including such granules.

Claims 2-3, 9-10, 13-16, 18-19, 24-25, 29-30, and 32 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Yanagimoto '038. This rejection is respectfully but strenuously traversed, and reconsideration and withdrawal of the rejection are respectfully requested as applicable to the amended claims.

The Examiner states that Yanagimoto '038 teaches colored infrared-reflective roofing granules comprising base particles coated with a cured coating composition comprising a coating binder and at least one infrared-reflective pigment. The Examiner admits that Yanagimoto '038 does not specifically teach L value, infrared reflectance or a second coating for particles. The Examiner further states that, however, the prior art reference teaches that it is well known in the art that reflection and absorption of the particles should be optimized, referencing column 1, lines 20-40. The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust L value and infrared reflectance of particles, since such would improve heat reflection properties of the roofing material. The Examiner further concludes that it would be obvious to one having ordinary skill in the art to add additional coatings to particles, since such would magnify the effects of light and heat reflection of such particles.

Even if the Examiner's conclusions are correct, one of ordinary skill in the art would not arrive at the presently claimed invention, and Yanagimoto '038 does not

establish a *prima facie* case of obviousness in respect of the presently claimed invention.

As noted above, Yanagimoto '038 is concerned with the problem of heat buildup when the outer walls or roof of a building or other structure are coated with a dark-colored paint. Yanagimoto '038 expressly teaches one of ordinary skill in the art faced with the problem of lowering the heat absorption of dark-colored roofs to paint the roof with a coating including Yanagimoto 038's composite pigment. This would teach one of ordinary skill in the art away from the solution disclosed by applicants, namely coating roofing granules with a coating composition including at least one colored, infrared reflective pigment, and using such granules in manufacturing bituminous roofing products.

In Yanagimoto 038's composite pigments, the underlying white base pigment should be covered over with the colored pigment. If the colored pigment concentration in the dispersion is too low, "the coating of the white pigment with the colorant becomes insufficient" (col. 6, lines 22-28). In contrast, in those embodiments of the presently claimed invention employing white pigments such as titanium dioxide, the titanium dioxide can be provided in an underlying or base layer. Yanagimoto '038 teaches away from providing white pigment in a separate layer. Indeed, one of Yanagimoto's asserted advantages is that the use of the composite pigment obviates the need to provide an underlying reflective layer including a white pigment. One of ordinary skill in the art would not employ an underlying base layer including a white pigment based on the disclosure of Yanagimoto '038. Yanagimoto '038 expressly teaches that including such a layer is disadvantageous because when repairs are to be made, the underlying white undercoat has to be repaired also (col. 1, lines 51-55).

The Examiner characterizes Yanagimoto '038 as disclosing roofing granules. This is incorrect. Yanagimoto '038 discloses composite pigments for paints that presumably may be used for coating roofs. However, "roofing granules" is a term of art denoting particles having average dimensions about two orders of magnitude greater than those of "pigments."

The Examiner contends that Yanagimoto '038 teaches that it is well known in the art that reflection and absorption of particles should be optimized, citing col. 1, lines 20-40. However, Yanagimoto '038 has nothing to say about optimizing the properties of particles. Instead, the portion of the disclosure to which the Examiner makes reference relates to painting roofs and the like with dark colored paints. Yanagimoto '038 discloses that the dark colored paints include pigments that absorb solar heat, while solar-reflective paints include reflective white pigments which yield white or light-colored paints. Yanagimoto '038 notes that there is an unmet demand for dark-colored, solar reflecting paints. One of ordinary skill in the art who attempted to "optimize" the absorbance and reflection properties of such paints would not arrive at applicants' invention. Instead, she would arrive at a not-so-dark colored paint that did not reflect solar heat as well as a paint based on a white pigment.

The Examiner has concluded that it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the L value and infrared reflectance of particles, since such would improve heat reflection properties of the roofing material. This may be true, but this would not provide the present invention. Adjusting the L value to improve the heat reflectance of the particles is easy to do, by simultaneously maximize the L value and solar reflectance by using a white pigment.

However, applicants claims 2-3, 9-10, 14-16, 18-19, 24-25, 29-30 and 32<sup>2</sup> all require L\* less than 60 or 55, depending on the specific claim. Optimizing L\* to maximize solar reflectivity would give an L\* substantially greater than 60. This may be obvious, but it is not what the applicants have done or are claiming.

Applicants advantageously provide dark colored roofing granules with improved solar heat reflectivity. As the experimental data provided in the specification show, the inventors have been able to substantially match the color of dark colored roofing granules while significantly improving the solar reflectance by the present invention. For example, in Example 2, roofing granules having a deep, reddish gold appearance (L\*=44.10, a\*=20.79, b\*=18.59) were prepared. These granules had a 9 % more reflectance than granules of the same color colored with conventional inorganic pigments. Similarly, in Example 5, brown (L\*=32.77, a\*=5.05, b\*=5.66) roofing granules having about a 50 percent increase in solar reflectivity were prepared, compared with similarly colored granules prepared using conventional colored pigments. Further, in Example 7, off-white roofing granules having about a 60 percent increase in reflectivity were prepared according to the present invention compared with similarly colored roofing granules prepared using conventional inorganic colorants.

The present invention has great practical significance: This means that consumers can install conventional-looking roofs made up of shingles with traditional colors – and yet gain substantial energy savings. There is no need to use soon-to-get-dirty white shingles, or cover the roof with white roof coatings, just to realize energy savings. The present invention thus represents a significant advance over the composite pigment-colored paints disclosed by the cited reference.

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<sup>2</sup> The Examiner has also rejected claim 13 on this basis, but claim 13 does not include a limitation as to L\* or reflectance. The rejection is not understood as applicable to claim 13, and clarification is respectfully requested.

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November 28, 2005

Thus, there is nothing that discloses or would suggest the presently claimed process to one of ordinary skill in the art. Reconsideration and withdrawal of the rejection entered under 35 U.S.C. 103(a) over Yanagimoto '038 are respectfully requested for these reasons.

Applicants respectfully solicit reconsideration, withdrawal of the rejections entered, and an early notice of allowance.

Respectfully submitted,



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# POWDER SIZES

U.S.A. SIEVE SERIES and TYLER EQUIVALENTS  
TYLER STANDARD SCREEN SCALE SIEVES

## U.S.A. SIEVE SERIES and TYLER EQUIVALENTS

A. S. T. M.  
-E-11-70

Sieve Designation		Sieve Opening		Nominal Wire Diameter		Tyler Screen Scale Equiv. Designation
Standard(a)	Alternate	mm	equiv-alent	mm	equiv-alent	
125 mm	5.in.	125	5	8	0.315	
106 mm	4.24 in.	106	4.24	6.4	0.252	
100 mm	4.0 in. (b)	100	4	6.3	0.248	
90 mm	3 1/2 in.	90	3.5	6.08	0.2394	
75 mm	3.0 in.	75	3	5.8	0.2283	
63 mm	2 1/2 in.	63	2.5	5.5	0.2165	
53 mm	2.12 in.	53	2.12	5.15	0.2028	
50 mm	2.0 in. (b)	50	2	5.05	0.1988	
45 mm	1 3/4 in.	45	1.75	4.85	0.1909	
37.5 mm	1 1/2 in.	37.5	1.5	4.59	0.1807	
31.5 mm	1 1/4 in.	31.5	1.25	4.23	0.1665	
26.5 mm	1.06 in.	26.5	1.06	3.9	0.1535	1.050 in.
25.0 mm	1.0 in. (b)	25	1	3.8	0.1496	
22.4 mm	7/8 in.	22.4	0.875	3.5	0.1378	.883 in.
19.0 mm	3/4 in.	19	0.75	3.3	0.1299	.742 in.
16.0 mm	5/8 in.	16	0.625	3	0.1181	.624 in.
13.2 mm	.530 in.	13.2	0.53	2.75	0.1083	.525 in.
12.5 mm	1/2 in. (b)	12.5	0.5	2.67	0.1051	
11.2 mm	7/16 in.	11.2	0.438	2.45	0.0965	.441 in.
9.5 mm	3/8 in.	9.5	0.375	2.27	0.0894	.371 in.
8.0 mm	5/16 in.	8	0.312	2.07	0.0815	2 1/2 mesh
6.7 mm	.265 in.	6.7	0.265	1.87	0.0736	3.0 mesh

6.3 mm	1/4 in. (b)	6.3	0.25	1.82	0.0717	
5.6 mm	No. 3 1/2 ©	5.6	0.223	1.68	0.0661	3 1/2 mesh
4.75 mm	No. 4	4.75	0.187	1.54	0.0606	4 mesh
4.00 mm	No. 5	4	0.157	1.37	0.0539	5 mesh
3.35 mm	No. 6	3.35	0.132	1.23	0.0484	6 mesh
2.80 mm	No. 7	2.8	0.111	1.1	0.043	7 mesh
2.36 mm	No. 8	2.36	0.0937	1	0.0394	8 mesh
2.00 mm	No. 10	2	0.0787	0.9	0.0354	9 mesh
1.70 mm	No. 12	1.7	0.0661	0.81	0.0319	10 mesh
1.40 mm	No. 14	1.4	0.0555	0.725	0.0285	12 mesh
1.18 mm	No. 16	1.18	0.0469	0.65	0.0256	14 mesh
1.00 mm	No. 18	1	0.0394	0.58	0.02285	16 mesh
850 um	No. 20	0.85	0.0331	0.51	0.0201	20 mesh
710 um	No. 25	0.71	0.0278	0.45	0.0177	24 mesh
600 um	No. 30	0.6	0.0234	0.39	0.0154	28 mesh
500 um	No. 35	0.5	0.0197	0.34	0.0134	32 mesh
425 um	No. 40	0.425	0.0165	0.29	0.0114	35 mesh
355 um	No. 45	0.355	0.0139	0.247	0.0097	42 mesh
300 um	No. 50	0.3	0.0117	0.215	0.0085	48 mesh
250 um	No. 60	0.25	0.0098	0.18	0.0071	60 mesh
212 um	No. 70	0.212	0.0083	0.152	0.006	65 mesh
180 um	No. 80	0.18	0.007	0.131	0.0052	80 mesh
150 um	No. 100	0.15	0.0059	0.11	0.0043	100 mesh
125 um	No. 120	0.125	0.0049	0.091	0.0036	115 mesh
106 um	No. 140	0.106	0.0041	0.076	0.003	150 mesh
90 um	No. 170	0.09	0.0035	0.064	0.0025	170 mesh
75 um	No. 200	0.075	0.0029	0.053	0.0021	200 mesh
63 um	No. 230	0.063	0.0025	0.044	0.0017	250 mesh
53 um	No. 270	0.053	0.0021	0.037	0.0015	270 mesh
45 um	No. 325	0.045	0.0017	0.03	0.012	325 mesh
38 um	No. 400	0.038	0.0015	0.025	0.001	400 mesh

(a) These standard designations correspond to the values for test sieve apertures recommended by the International Standards Organization Geneva, Switzerland.

(b) These sieves are not in the fourth root of 2 Series, but they have been included because they are in common usage.

(c) These numbers (3 1/2 to 400) are the approximate number of openings per linear inch but it is preferred that the sieve be identified by the standard designation in millimeters or um.

## TYLER STANDARD

Tyler Standard	Closer Sizing	Mesh Designation	USA Sieve Series Equivalents
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**SCREEN  
SCALE  
SIEVES**

<b>Scale</b>	<b>Ratio</b>		<b>Standard Designation</b>	<b>Alternate Designation</b>
1.05	1.05		26.5 mm	1.06 in.
	0.883		22.4 mm	7/8 in.
0.742	0.742		19.0 mm	3/4 in.
	0.624		16.0 mm	5/8 in.
0.525	0.525		13.2 mm	.530 in.
	0.441		11.2 mm	7/16 in.
0.371	0.371		9.5 mm	3/8 in.
	0.312	2.5	8.0 mm	5/16 in.
0.263	0.263	3	6.7 mm	.265 in.
	0.221	3.5	5.6 mm	No. 3 1/2
0.185	0.185	4	4.75 mm	No. 4
	0.156	5	4.00 mm	No. 5
0.131	0.131	6	3.35 mm	No. 6
	0.11	7	2.80 mm	No. 7
0.093	0.093	8	2.36 mm	No. 8
	0.078	9	2.00 mm	No. 10
0.065	0.065	10	1.70 mm	No. 12
	0.055	12	1.40 mm	No. 14
0.046	0.046	14	1.18 mm	No. 16
	0.039	16	1.00 mm	No. 18
0.0328	0.0328	20	850 um	No. 20
	0.0276	24	710 um	No. 25
0.0232	0.0232	28	600 um	No. 30
	0.0195	32	500 um	No. 35
0.0164	0.0164	35	425 um	No. 40
	0.0138	42	355 um	No. 45
0.0116	0.0116	48	300 um	No. 50
	0.0097	60	250 um	No. 60
0.0082	0.0082	65	212 um	No. 70
	0.0069	80	180 um	No. 80
0.0058	0.0058	100	150 um	No. 100
	0.0049	115	125 um	No. 120
0.0041	0.0041	150	106 um	No. 140
	0.0035	170	90 um	No. 170
0.0029	0.0029	200	75 um	No. 200
	0.0024	250	63 um	No. 230
0.0021	0.0021	270	53 um	No. 270
	0.0017	325	45 um	No. 235
0.0015	0.0015	400	38 um	No. 400

*In the table of the Tyler Standard Screen Scale Sieve Series both the square root of two Series as well as the expanded series for closer sizing according to the fourth root of two as shown.*